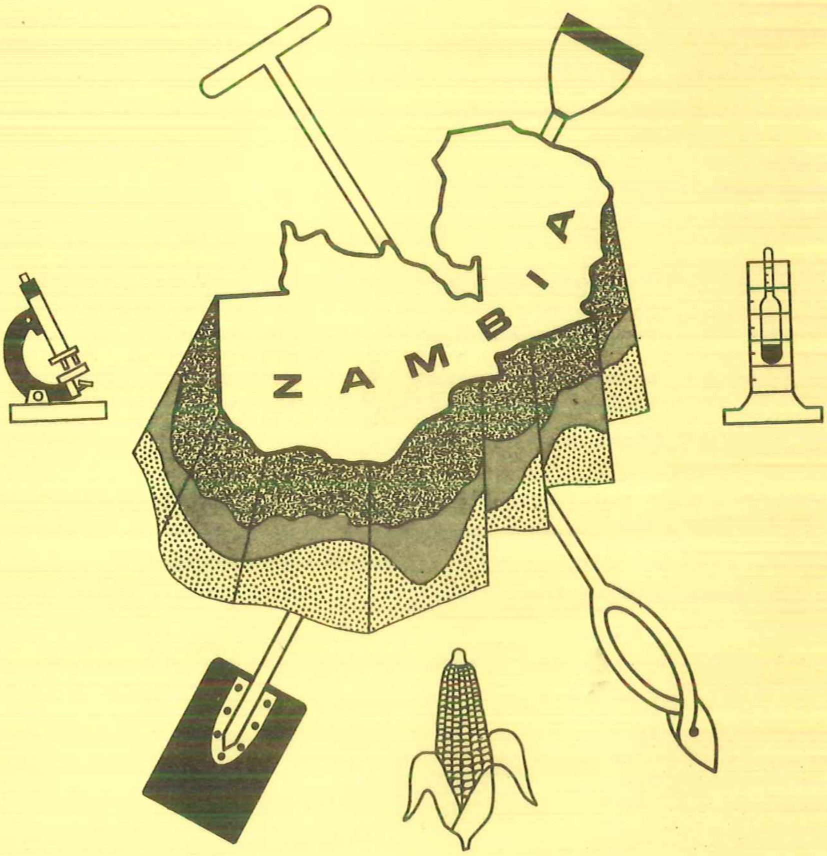
REPUBLIC OF ZAMBIA

SOIL BULLETIN No. 9

AGRO-CLIMATIC ZONES IN ZAMBIA

BY

W. J. VELDKAMP, M. MUCHINDA & A.P. DELMOTTE



SOIL SURVEY UNIT
LAND USE BRANCH
DEPARTMENT OF AGRICULTURE
1984

Agro-climatic zones in Zambia

by W.J. Veldkamp, M. Muchinda and A.P. Delmotte

Introduction and outline of methodology

In 1981 Bunyolo et al. presented a paper on soil moisture and climatic conditions in Zambia. This publication contains an agro-climatic map dividing Zambia into regions, based on average rainfall, length of the growing period, (using FAO methods) and the mean daily temperature during the growing period. The average rainfall was divided into bimodal and mono-modal zones.

In view of the preparation of small scale crop suitability maps a slightly different approach has been used in this report. The average rainfall was omitted. Only the length of the growing season has been used by indicating the beginning and end 10-day period of the growing season, assuming sufficient rain in between. The start and end 10-day period are those periods in which rainfall within the 10-day period exceeds half of the potential evapotranspiration, respectively the first of such periods after the dry hot season (usually in November-December) and the last of such periods (usually in February-May). Instead of average values, the 70% probability values for 10-day periods have been taken. In this way the length of the growing season is a fairly reliable value and the length of the growing season can be expexted in 7 out of 10 years. In the other three years the actual length is less than indicated. As the rainfall during the beginning and the end of the growing season is often erratic, an additional 0.5 10-day period was added in some cases, where it was thought that this would actually represent a real part of the growing season. The soil moisture storage capacity was included in the determination of the length of the growing season by taking half of the estimated available water holding capacity of the soil up to 1.0 m depth and to divide this value by the potential evapotranspiration at 70% probability. This resulted in an estimation of the extension of the growing season (with 70% probability) in the range of 1.0 to 2.0 10-day periods. Long term data for only 29 stations were available for this exercise. In the coming years the number of stations will be increased substantially.

For the same 29 stations the probability of occurrence of dry 10-day periods within the growing season was determined. A dry 10-day period is one in which the rainfall is less than 30 mm. This value is especially important in the southern part of the country where rainfall is erratic. In some regions up to one half of the growing season in fact has not enough rainfall in certain periods to exceed half of the evapotranspiration

tion. In general the most southern parts of the country usually have a growing season characterized by rainfall which does not exceed the potential evapotranspiration in almost any of the 10-day periods within the growing season. The 70% probability level was again chosen for the each station. A dry 10-day period at the beginning or at the end was not taken into account, because of the often erratic rainfall in such periods. However, when both start and end 10-day periods showed serious drought occurrence, they were counted as 0.5 dry 10-day period.

For a slightly different set of stations data on monthly mean temperatures were compared. It was dicided to use the mean monthly minimum and night temperatures during the period December to February to indicate areas with relatively cool rainy seasons. On the other hand areas with a high mean monthly temperatures during the same period have been indicated as well.

The amount of sunshine has a significant effect on the yield potential of crops. Especially in the high rainfall zone of Zambia more overcast weather reduces this potential. Data were obtained from Hutchinson, 1975.

Lastly data on the occurrence of frost were included. Ground frost occurs especially in the south-western part of the country. It is only of some importance in the surrounding areas where frost may occur in the topographically lowest places (valleys, dambos). Data were obtained from a frost map of the Ministry of Lands, Natural Resources and Tourism, 1974.

Basic data

In total five parameters were included in the preparations of the agro-climatic map:

- length of growing season (70% probability)
- occurrence of drought in rainy season (70% probability)
- mean monthly temperature (minimum, night and maximum) in period December to February
- amount of sunshine in the rainy season
- occurrence of frost in the dry season (usually June-August)

The basic data for those five parameters are given in tables 1-4 and Figs. 1-2.

Results

The results of plotting the various data on small scale maps (roughly 1:8,000,000 scale) are given in Figs. 3-7.

The combination of all five parameters is shown in Fig. 8. This agro-climatic zones map was compiled in the following way:

1. Areas within each class of occurrence of drought (I to E) were kept separate.
2. Occurrence of frost was added to the class of occurrence of drought.
3. The amount of sunshine in the rainy season is usually high in the areas where drought and frost occur. Only special areas have limited sunshine.
4. The length of the growing season has been superimposed. For length less than 130 days (70% probability) separation into 10-day intervals has been made. Areas with a longer growing season were only separated on basis of differences in occurrence of drought and amount of sunshine or occurrence of frost.
5. The temperature data for each zone have not been used for subdivision of zones, but was rather used to characterize areas with relatively cool or hot growing seasons.
6. Zones without drought or frost were separated on basis of length of growing season and amount of sunshine. Again 10-day intervals were used for areas with less than 130 days growing season. The temperature range has been indicated for each zone, but was not used for subdivision.

In order to identify agro-ecological zones fig. 8 was superimposed on the soil map. By relating the boundaries between the agro-climatic zones to soil boundaries a reduction of the number of zones, as well as a probably better indication of the actual zones could be obtained. It was assumed that important soil boundaries, e.g. between swampy and often waterlogged areas compared to well drained plateau soils, could be used to drow the most probable location of boundaries between agro-ecological zones. More detailed climatic data are needed to confirm this. The end result is presented in fig. 9. Table 5 lists the agro-ecological zones on this figure.

References

Hutchinson, P. 1975. New sunshine maps for Zambia. Journal Tropical Geography, Vol. 40, 32-39

Bunyolo, A.M. et al., 1982. Rating of land qualities, soil moisture and climatic conditions and their conversion into land suitability in Zambia. Soil Survey Unit, Bulletin no. 5

Soil Survey Unit, 1983 Soil map of Zambia.

Meteorological Department, 1975. Climatological summaries for Zambia, periods ending December 1970.

Fig. 3

REPUBLIC OF ZAMBIA
AMOUNT OF SUNSHINE (HRS) DURING RAINY SEASON 1958 - 1972
(After Hutchinson 1975)

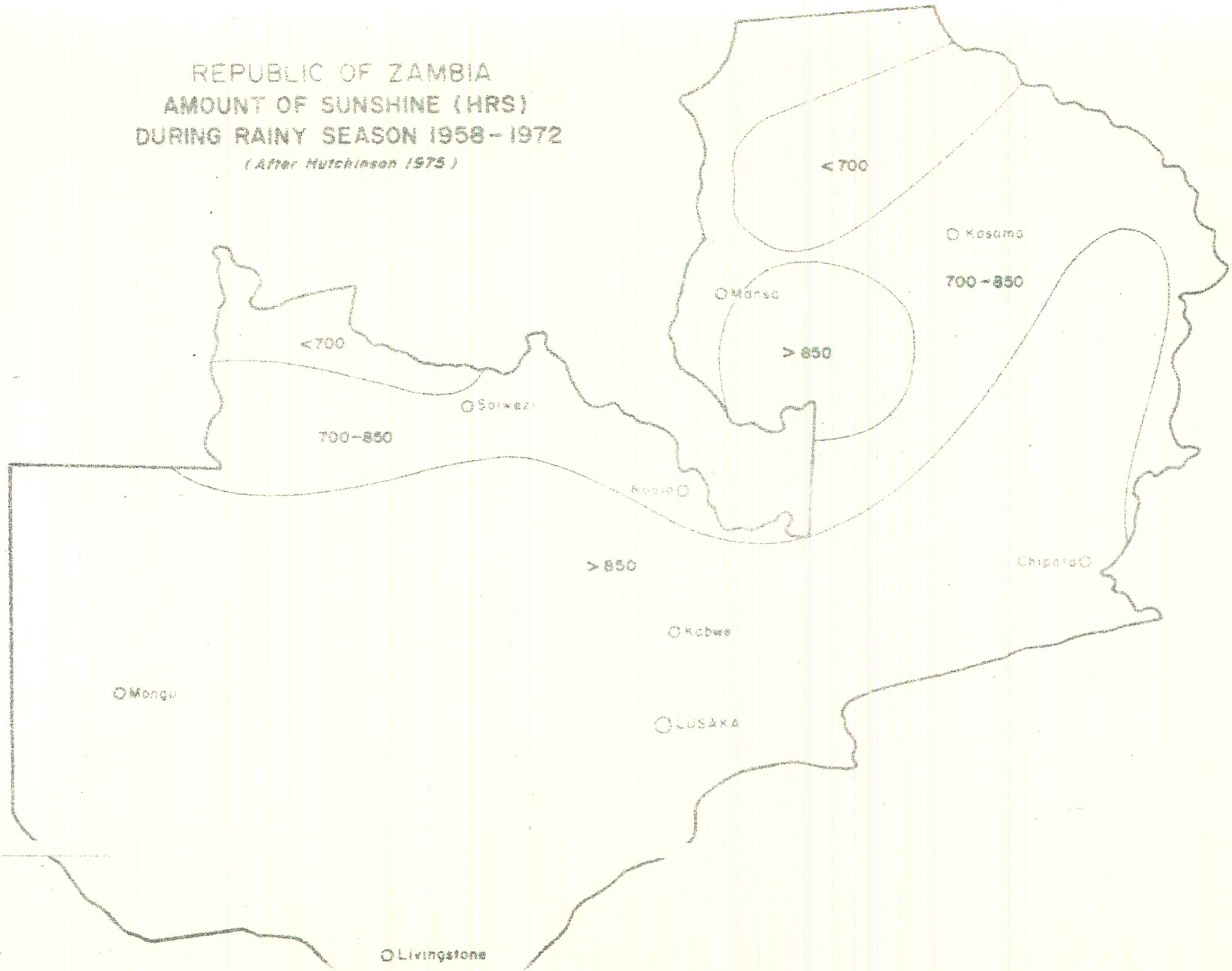
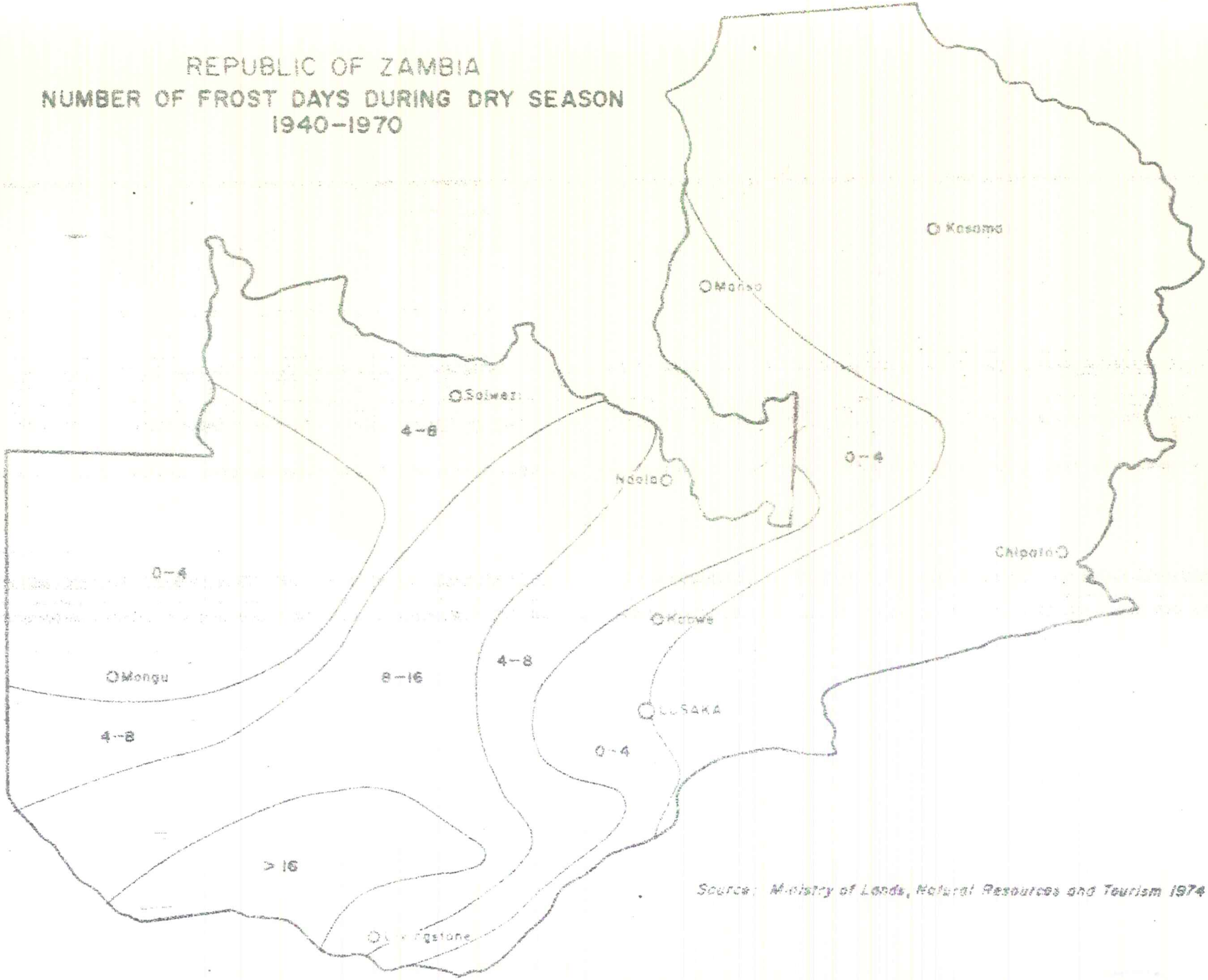


Fig. 2

REPUBLIC OF ZAMBIA
NUMBER OF FROST DAYS DURING DRY SEASON
1940–1970



Source: Ministry of Lands, Natural Resources and Tourism 1974

Table 1A 70% probability data of rainfall and potential evapotranspiration of 10-day periods from October to April for 26 Stations

	KAWAMBWA		MANSA		SAMFYA		MBALA		KASAMA		MPIKA		LUNDAZI	
	R	PET	R	PET	R	PET	R	PET	R	PET	R	PET	R	PET
OCT 1	2	46	0	52	0	47	0	48	0	61	0	52	0	56
OCT 2	8	45	0	53	0	49	0	49	0	65	0	55	0	60
OCT 3	19	42	0	49	0	47	0	45	0	56	0	51	0	57
NOV 1	33	37	22	43	14	43	12	40	18	48	4	47	0	54
NOV 2	41	34	31	39	18	40	17	36	24	43	0	43	3	51
NOV 3	56	33	38	37	34	39	40	34	48	42	25	40	10	47
DEC 1	58	33	51	36	59	39	44	33	49	43	43	37	22	42
DEC 2	62	33	52	34	75	38	62	31	55	42	55	34	35	38
DEC 3	65	33	67	34	82	38	64	31	69	39	70	34	54	37
JAN 1	57	35	54	35	73	38	60	31	65	37	55	34	47	37
JAN 2	52	36	48	35	53	37	40	30	59	34	49	33	38	36
JAN 3	43	35	54	33	58	35	59	30	67	33	54	32	41	35
FEB 1	44	33	52	31	62	32	56	29	58	32	51	30	30	33
FEB 2	39	32	52	30	54	31	41	28	57	30	59	29	33	31
FEB 3	40	33	42	31	55	32	39	30	47	32	39	30	26	32
MAR 1	62	34	45	34	70	35	56	31	58	34	44	33	47	35
MAR 2	61	35	56	35	68	37	48	33	57	35	20	34	28	36
MAR 3	63	35	28	35	40	37	46	33	42	35	19	33	16	35
APR 1	31	33	7	34	14	37	33	33	13	32	0	32	5	34
APR 2	25	33	2	34	0	38	13	33	3	32	0	32	0	33
APR 3	8	32	0	33	0	35	6	34	0	30	0	30	0	32
SUM	869		702		841		747		789		586		454	

	CHIPATA		PETAUKE		SERENJE		KABWE		MUMBWA		MWINILUNGA	
	R	PET	R	PET	R	PET	R	PET	R	PET	R	PET
OCT 1	0	59	0	50	0	50	0	64	0	61	3	43
OCT 2	0	64	0	53	0	52	0	68	0	63	12	43
OCT 3	0	59	0	51	0	49	0	61	0	57	19	39
NOV 1	5	54	12	47	16	45	12	51	12	50	47	35
NOV 2	5	50	8	45	11	41	9	44	20	44	54	32
NOV 3	21	46	17	43	25	39	16	43	15	42	52	32
DEC 1	34	43	37	40	51	37	43	44	42	42	77	33
DEC 2	48	40	48	38	53	34	55	42	47	40	56	32
DEC 3	58	39	52	38	82	34	59	41	36	39	69	33
JAN 1	56	39	50	38	52	36	48	41	55	40	57	33
JAN 2	43	37	54	38	48	36	35	39	25	39	43	33
JAN 3	58	36	56	37	66	34	52	38	63	37	65	32
FEB 1	56	34	53	36	54	31	33	35	54	34	57	30
FEB 2	43	32	65	35	59	29	42	33	36	32	44	29
FEB 3	49	34	39	36	53	31	21	35	22	34	41	30
MAR 1	38	37	35	37	49	34	28	34	13	38	69	32
MAR 2	21	38	12	37	22	36	9	40	9	40	69	33
MAR 3	16	37	9	36	8	35	0	39	0	39	45	32
APR 1	5	36	6	35	0	33	0	37	0	38	15	32
APR 2	0	35	0	33	0	32	0	36	0	37	11	32
APR 3	0	34	0	32	0	30	0	34	0	35	0	30
SUM	555		546		650		465		425		904	

Table 6. 70% Probability data of rainfall and potential evapotranspiration of 10-day periods from October to April for 26 Stations

	SOLWEZI		KABOMPO		KASEMPA		ZAMBEZI		NDOLA		MONGU		KAOMA	
	R	PET	R	PET	R	PET	R	PET	R	PET	R	PET	R	PET
OCT 1	0	41	0	45	0	50	0	52	0	62	0	67	0	52
OCT 2	0	42	0	47	0	52	3	52	0	64	0	66	0	55
OCT 3	5	40	3	44	3	47	8	47	5	57	2	58	3	51
NOV 1	29	37	27	40	20	47	25	42	15	48	14	49	14	45
NOV 2	43	34	18	37	28	41	29	38	30	41	21	42	14	41
NOV 3	55	34	32	36	36	37	36	37	30	39	15	41	18	39
DEC 1	62	35	52	37	68	37	46	38	65	39	38	41	55	39
DEC 2	65	32	54	37	56	36	17	38	[illegible]	37	50	40	53	38
DEC 3	65	35	49	37	62	35	[illegible]	36	67	36	45	40	47	38
JAN 1	73	34	50	38	60	36	35	38	63	37	42	42	37	39
JAN 2	48	34	47	38	56	35	44	38	44	37	27	43	37	39
JAN 3	76	35	58	36	58	34	56	36	75	35	55	41	53	37
FEB 1	55	37	45	35	52	31	45	33	70	32	38	41	42	35
FEB 2	49	29	43	32	57	30	56	31	60	31	50	38	47	34
FEB 3	47	30	39	35	41	31	43	33	48	32	50	37	52	35
MAR 1	67	32	48	35	40	34	51	35	50	36	30	40	25	38
MAR 2	48	35	26	36	19	36	27	37	27	37	31	42	11	39
MAR 3	24	35	8	35	8	35	18	36	10	37	8	41	0	34
APR 1	8	32	9	34	0	34	0	36	5	35	4	39	0	37
APR 2	4	31	0	33	0	33	0	35	5	34	0	38	0	35
APR 3	0	29	0	31	0	31	0	34	0	33	0	38	0	33
SUM	800		607		666		625		733		504		485	

	SESHEKE		MT.MAKULU		KAFUE		MAGOYE		CHOMA		LSTONE	
	R	PET	R	PET	R	PET	R	PET	R	PET	R	PET
OCT 1	0	52	0	66	0	66	0	61	0	46	0	60
OCT 2	0	55	0	68	0	69	0	54	0	50	0	64
OCT 3	0	54	0	61	0	62	0	59	0	48	0	59
NOV 1	13	52	10	52	6	53	14	51	10	45	9	52
NOV 2	4	50	17	45	7	47	11	46	4	44	5	48
NOV 3	11	48	11	43	8	44	8	44	15	44	11	47
DEC 1	25	46	39	43	29	44	27	44	36	45	20	48
DEC 2	30	44	41	48	48	41	44	42	33	45	35	47
DEC 3	25	45	29	40	45	41	44	42	28	44	30	46
JAN 1	25	45	37	40	33	41	33	42	39	44	26	45
JAN 2	22	45	25	39	26	41	24	42	24	44	23	44
JAN 3	39	42	48	37	55	39	43	40	40	42	43	41
FEB 1	26	39	35	33	21	36	26	37	31	40	30	38
FEB 2	28	37	36	31	36	34	29	35	39	38	26	35
FEB 3	11	38	19	34	16	36	21	37	20	38	9	37
MAR 1	17	42	18	38	11	39	13	39	19	39	14	42
MAR 2	6	44	0	41	7	[illegible]	2	41	7	39	[illegible]	44
MAR 3	0	[illegible]	0	[illegible]	0	[illegible]	0	38	0	[illegible]	[illegible]	42
APR 1	0	38	0	[illegible]	0	[illegible]	0	36	0	[illegible]	[illegible]	39
APR 2	0	36	0	38	0	[illegible]	0	[illegible]	0	[illegible]	0	36
APR 3	0	33	0	36	0	[illegible]	0	33	0	[illegible]	0	34
SUM	273		364		347		338		346		284	

Table 1c 70% probability data of rainfall and potential evapotranspiration of 10-day periods from October to April for three additional stations.

		SINAZE		TEMBWE		KATOND	
		R	PET	R	PET	R	PET
Oct	1	0	46	0	57	0	57
Oct	2	0	50	0	61	0	59
Oct	3	0	48	0	57	0	55
Nov	1	0	45	0	52	0	49
Nov	2	0	44	0	49	3	45
Nov	3	7	44	10	46	0	43
Dec	1	13	45	18	42	20	42
Dec	2	36	45	34	39	20	40
Dec	3	33	44	31	38	34	39
Jan	1	31	44	30	37	27	39
Jan	2	22	44	28	35	23	39
Jan	3	37	42	35	34	25	37
Feb	1	39	40	41	33	19	34
Feb	2	36	38	49	31	29	33
Feb	3	21	38	32	32	15	35
Mar	1	23	39	39	35	14	38
Mar	2	15	39	29	36	0	39
Mar	3	0	36	19	35	0	38
Apr	1	0	32	13	35	0	37
Apr	2	0	29	11	34	0	36
Apr	3	0	26	6	33	0	34
SUM		314		425		229	

Table 2. Determination of length of growing season, including an estimation for soil moisture storage (26 stations plus estimations for three additional stations)

Station	Growing season (R>0.5 PET)+ (70% probability) Start	end	Total number of 10-day periods	Number of additional 10-day periods due to soil moisture storage (70% probability)	Total growing season (10-day periods, 70% probability)
	10-day periods				
Kawambwa	Nov.1	Apr.2	17.0 (+0.5)	1.5	19.0
Mansa	Nov.1	Mar.3	15.0	1.5	16.5
Samfya	Nov.3	Mar.3	13.0 (+0.5)	1.5	15.0
Mbala	Nov.3	Apr.1	14.0 (+0.5)	1.5	16.0
Kasama	Nov.2	Mar.3	14.0 (+0.5)	1.5	16.0
Mpika	Nov.3	Mar.3	13.0	2.0	15.0
Lundazi	Dec.1	Mar.2	11.0 (+0.5)	1.5	13.0
Chipata	Dec.1	Mar.2	11.0 (+0.5)	2.0	13.5
Petauke	Dec.1	Mar.1	10.0 (+0.5)	1.5	12.0
Serenje	Nov.3	Mar.2	12.0	1.5	13.5
Kabwe	Dec.1	Mar.1	10.0	1.5	11.5
Mumbwa	Dec.1	Feb.3	9.0 (+0.5)	2.0	11.5
Mwinilunga	Nov.1	Mar.3	15.0 (+0.5)	1.5	17.0
Solwezi	Nov.1	Mar.3	15.0	1.5	16.5
Kabompo	Nov.1	Mar.2	14.0	1.5	15.5
Kasempa	Nov.2	Mar.2	13.0 (+0.5)	1.5	15.0
Zambezi	Nov.1	Mar.3	15.0	1.0	16.0
Ndola	Nov.2	Mar.2	13.0 (+0.5)	1.5	15.0
Mongu	Dec.1	Mar.2	11.0 (+0.5)	1.0	12.5
Kaoma	Dec.1	Mar.1	10.0 (+0.5)	1.5	12.0
Sesheke	Dec.1	Feb.2	8.0	1.0	9.0
Mt. Makulu	Dec.1	Feb.3	9.0 (+0.5)	2.0	11.5
Kafue pold.	Dec.1	Feb.2	8.0 (+0.5)	2.0	10.5
Magoye	Dec.1	Feb.3	9.0	1.5	10.5
Choma	Dec.1	Feb.3	9.0 (+0.5)	1.0	10.5
L-stone	Dec.2	Feb.2	7.0 (+0.5)	1.5	9.0
Katondwe M.	Dec.3	Feb.2	6.0 (+0.5)	1.5	8.0
Sinazeze	Dec.2	Mar.1	9.0	1.5	10.5
Tembwe	Dec.2	Mar.3	11.0 (+0.5)	1.5	13.0

Note:

+ Derived from Table 1

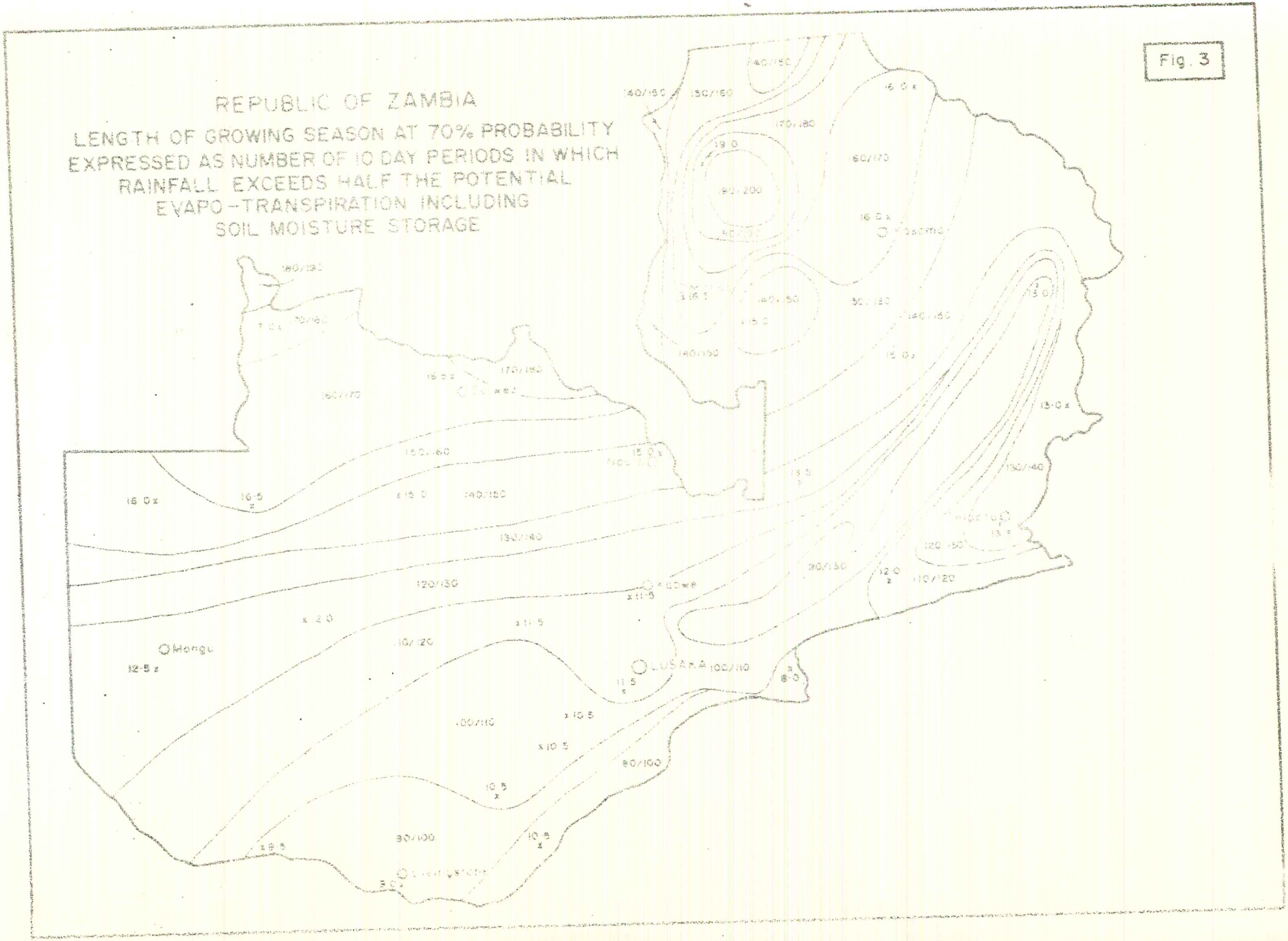


Fig. 3
REPUBLIC OF ZAMBIA
LENGTH OF GROWING SEASON AT 70% PROBABILITY
EXPRESSED AS NUMBER OF 10 DAY PERIODS IN WHICH
RAINFALL EXCEEDS HALF THE POTENTIAL
EVAPO-TRANSPIRATION INCLUDING
SOIL MOISTURE STORAGE
Mongu
LUSAKA
180/190
160/170
170/180
150/160
140/150
130/140
120/130
110/120
100/110
90/100
80/100
190/200
16·0 x
16·5
12·5 x
13·0 x
8·0

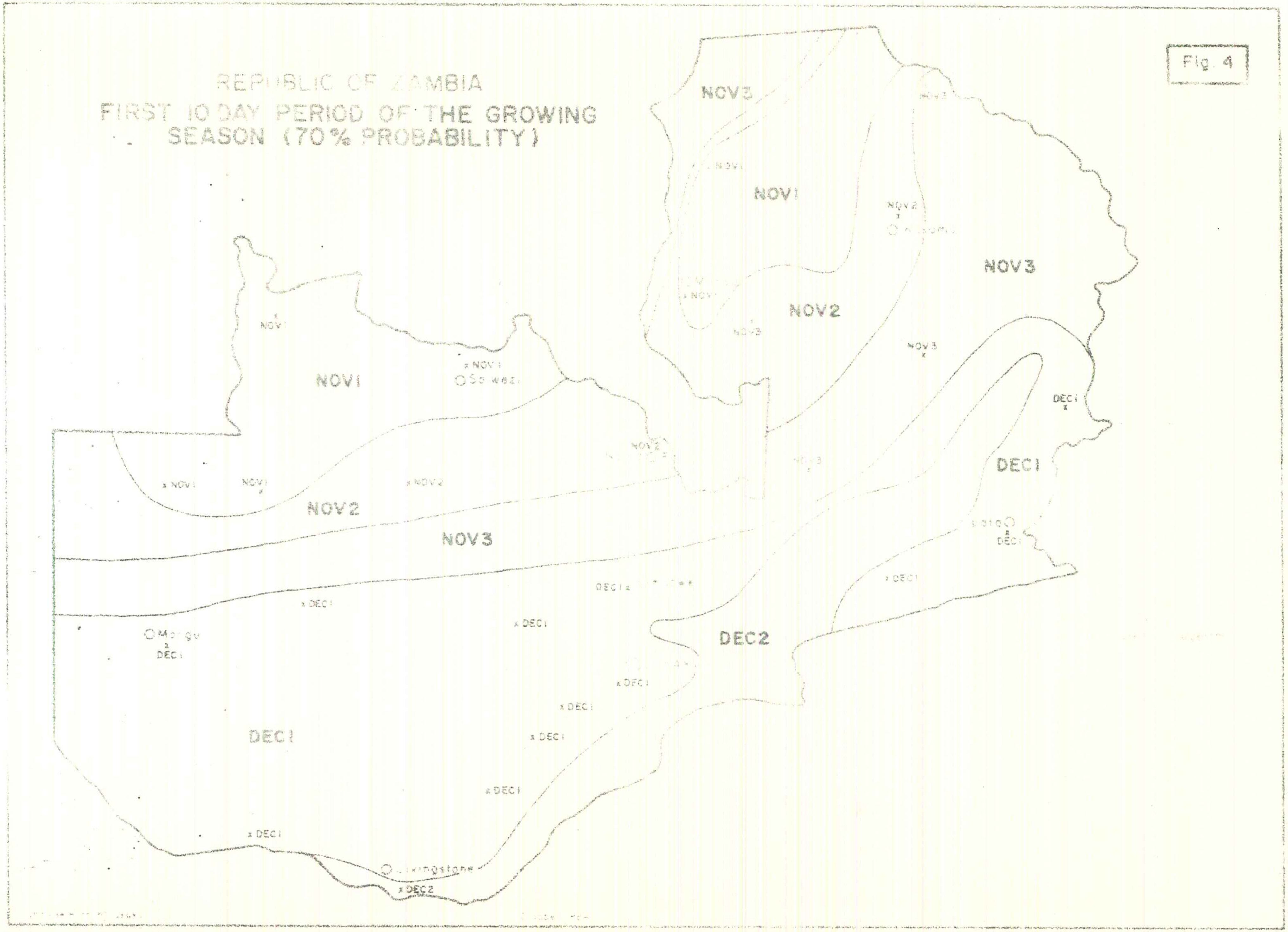
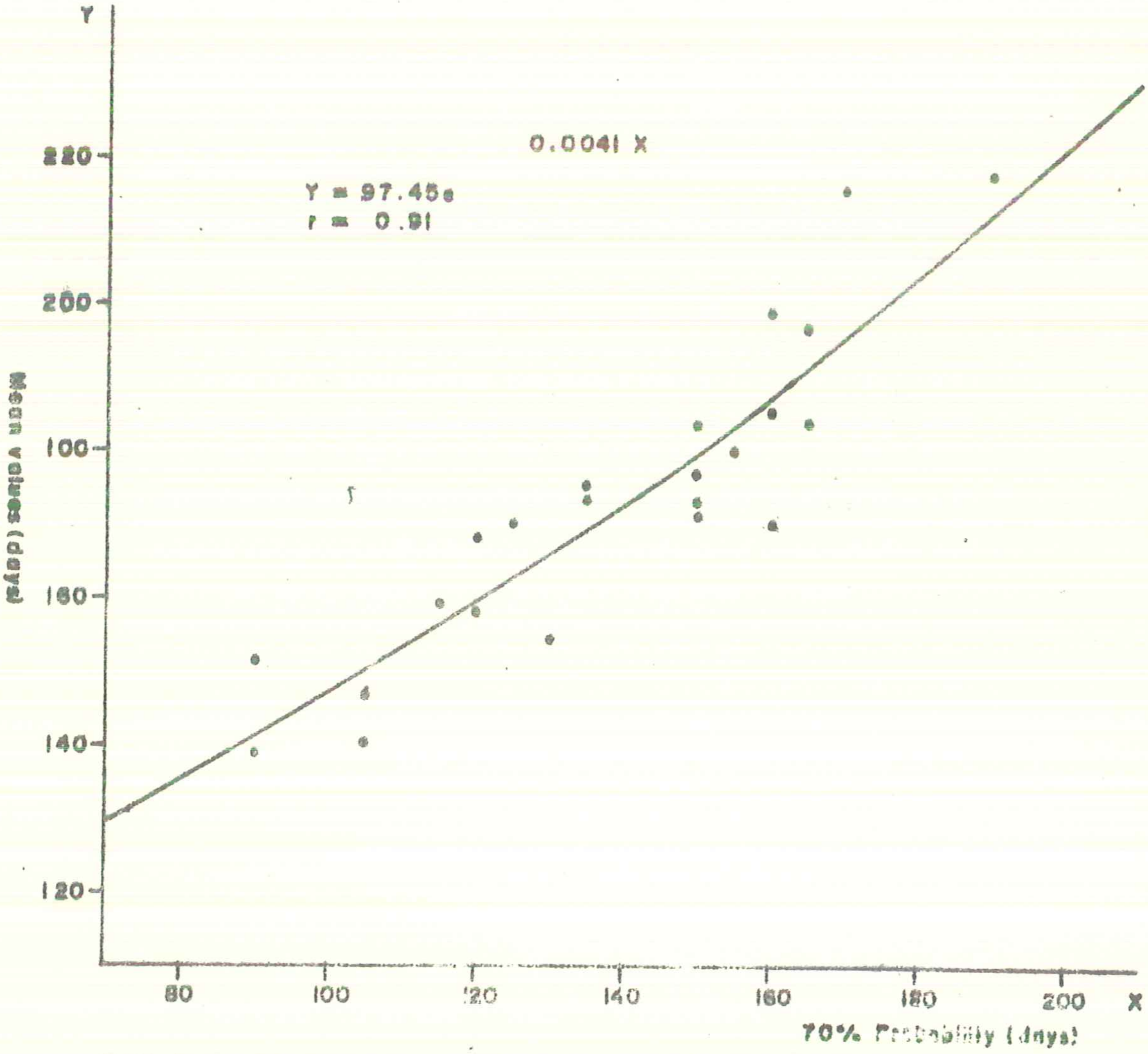


Fig. 4
REPUBLIC OF ZAMBIA
FIRST 10 DAY PERIOD OF THE GROWING SEASON (70% PROBABILITY)
NOV3
NOV1
NOV2
NOV3
NOV1
NOV2
NOV3
DEC1
DEC1
DEC2
Livingstone
DEC2

FIG. 5 CORRELATION BETWEEN LENGTH OF GROWING SEASON WITH 70% PROBABILITY AND MEAN VALUES



70% Prob.	80	90	100	110	120	130	140	150	160	170	180	190	200
Mean values.	135	141	147	152	159	166	173	180	188	195	204	212	221

Mean values.	130	140	150	160	170	180	190	200	210	220
70% Prob.	70	89	106	121	137	150	163	175	188	199

TABLE 3. Probability in % of a 10-day period with less than 30 mm rain for 29 stations.

10-Day period: Station	Oct.3	Nov.1	Nov.2	Nov.3	Dec.1	Dec.2	Dec.3	Jan.1	Jan.2	Jan.3	Feb.1	Feb.2	Feb.3	Mar.1	Mar.2	Mar.3	Apr.1	Apr.2	Apr.3	Years	Total number of dry 10-day periods within growing season (Dec-March)
Kafue polder	96	78	61	57	35	22	17	26	26	4	43	32	43	52	65	91	87	91	100	1976-1980	1
Magoye	83	59	48	59	28	17	24	17	41	14	34	31	45	52	72	79	86	83	97	1951-1980	3
Choma	90	60	63	53	23	30	30	17	33	13	37	20	47	43	57	70	80	83	100	1950-1980	3
Mt.Makulu	96	64	61	61	35	25	21	18	21	7	21	18	39	39	54	86	85	86	96	1952-1980	0 (+0.5)
Livingstone	83	66	66	70	37	17	33	40	30	17	33	43	60	53	66	73	90	97	87	1950-1980	4
Samfya	83	52	43	39	13	0	4	9	13	9	0	4	9	4	13	23	40	65	91	1957-1980	0
Mongu	81	63	33	66	22	11	7	11	33	7	22	19	37	19	33	52	56	81	96	1955-1980	2
Sesheke	82	61	61	61	36	43	36	39	36	18	25	39	54	50	57	82	85	86	96	1950-1978	4 (+0.5)
Mumbwa	91	64	36	59	18	23	18	9	32	0	23	23	45	55	59	77	[illegible]	82	95	1957-1980	1
Lundazi	93	86	79	62	38	17	7	14	17	21	7	17	38	14	31	55	[illegible]	53	90	1950-1980	1 (+0.5)
Solwezi	53	33	13	30	3	3	6	0	13	3	10	6	10	6	13	37	53	57	87	1950-1980	0 (+0.5)
Chipata	90	73	63	47	23	13	7	3	10	3	7	13	20	17	43	[illegible]	[illegible]	70	87	1950-1980	0
Kabwe	83	70	67	40	17	10	13	17	27	10	27	23	33	27	60	70	87	87	100	1950-1980	1
Serenje	93	57	57	37	10	13	7	13	20	3	10	10	7	13	40	50	83	77	87	1950-1980	0 (+0.5)
Kabompo	70	30	43	27	7	7	13	13	10	3	10	17	17	13	33	57	53	87	93	1950-1980	0 (+0.5)
Zambezi	70	40	30	27	13	13	23	7	17	7	10	7	27	10	33	40	73	83	97	1950-1980	1 (+0.5)
Petauke	90	63	73	40	20	13	10	13	10	7	7	3	13	33	53	70	90	90	93	1950-1980	0
Kaoma	90	43	53	43	10	7	17	30	17	10	17	7	33	33	70	67	80	87	100	1950-1980	2
Mpika	100	53	57	50	20	7	0	3	10	7	10	10	17	20	30	37	90	87	97	1950-1980	1 (+0.5)
Kawambwa	47	17	7	7	3	0	0	7	7	13	23	23	13	3	7	7	20	47	70	1950-1980	0
Mansa	77	47	33	23	7	7	0	7	10	10	7	10	13	10	7	30	63	67	93	1950-1980	0 (+0.5)
Mbala	90	67	50	13	17	3	3	7	10	3	3	10	20	3	7	10	30	43	80	1950-1980	0
[illegible]	36	50	[illegible]	[illegible]	10	7	7	7	10	0	0	3	10	10	7	20	47	60	77	1950-1980	0
Ndola	83	50	33	27	7	3	10	7	13	3	0	10	10	13	30	57	70	77	97	1950-1980	0 (+0.5)
Kasempa	73	50	37	13	7	7	3	7	10	7	13	7	17	13	43	57	67	83	93	1950-1980	0 (+0.5)
Mwinilunga	43	13	13	3	0	3	0	0	13	3	3	17	13	3	7	13	43	57	80	1950-1980	0
Katondwe Mis.	93	77	80	67	40	43	20	40	43	33	40	27	50	53	67	83	97	97	100	1950-1980	
Sinazeze	96	78	74	61	39	35	30	26	30	22	26	26	35	43	48	70	70	78	91	1956-1980	3 [illegible]
Tembwe	97	90	83	72	45	28	21	31	41	31	24	10	21	14	34	45	56	62	76	1951-1981	4 (-0.5)

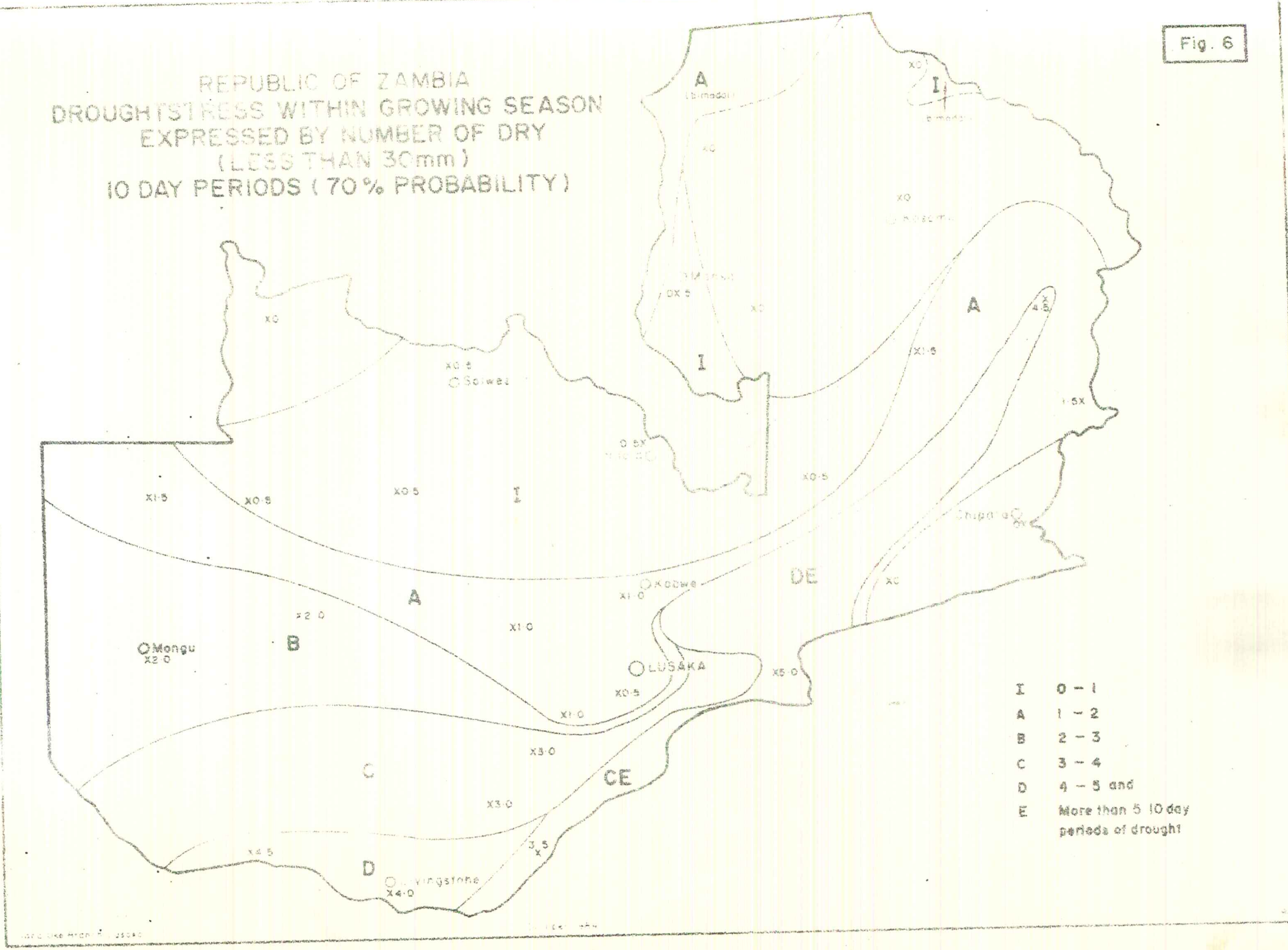


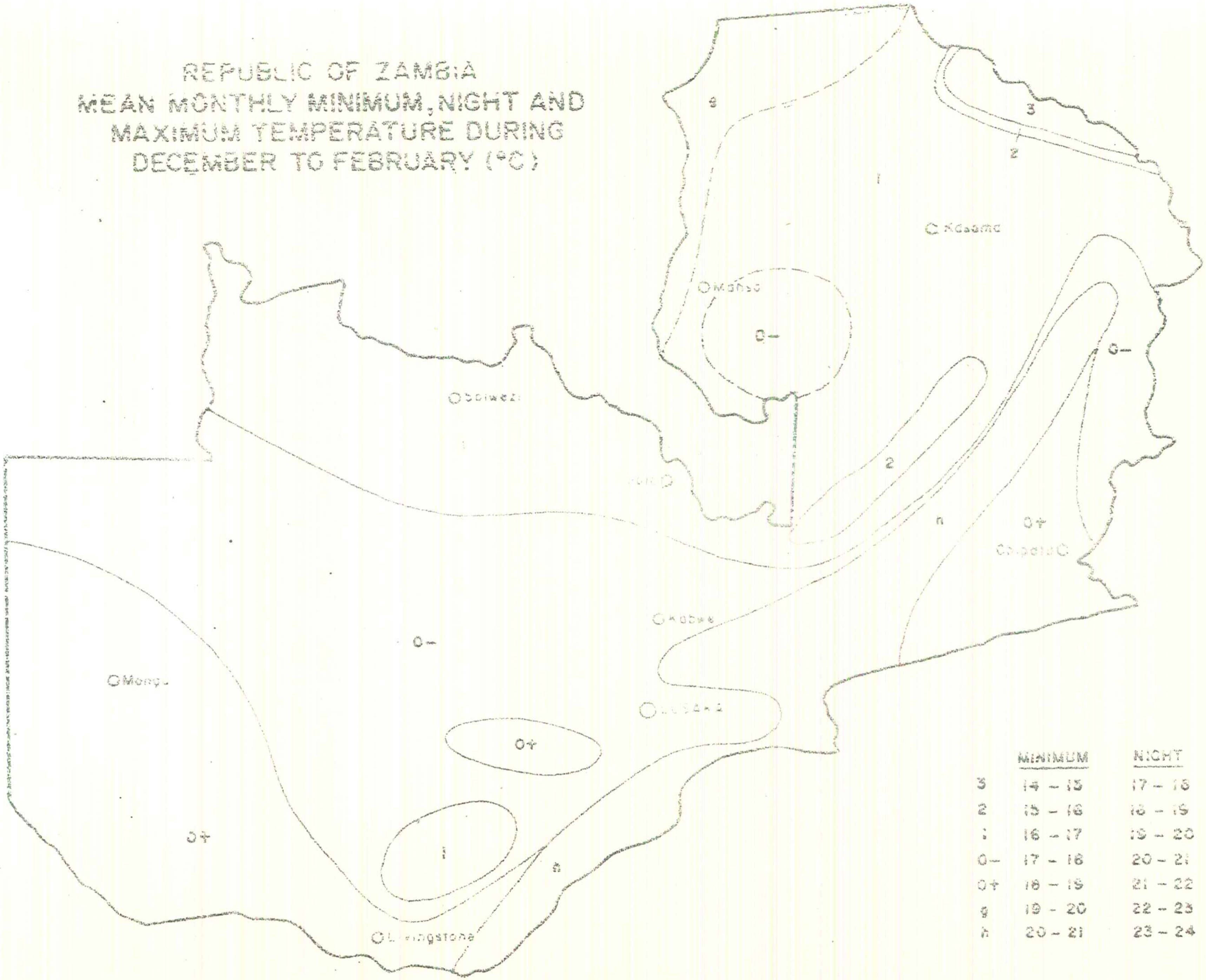
Fig. 6
REPUBLIC OF ZAMBIA
DROUGHTSTRESS WITHIN GROWING SEASON
EXPRESSED BY NUMBER OF DRY
(LESS THAN 30mm)
10 DAY PERIODS (70% PROBABILITY)
Solwezi
Kabwe
Chipata
Mongu
LUSAKA
Livingstone
A
I
B
C
D
DE
CE
X0
X0·5
X1·5
X1·0
X2·0
X3·0
X4·5
X4·0
X5·0
I 0 – 1
A 1 – 2
B 2 – 3
C 3 – 4
D 4 – 5 and
E More than 5 10 day
periods of drought

Table 4. The mean monthly minimum, night and maximum temperature at 2.0 m height for 26 stations, as well as additional data for two stations in the Luangwa valley (Msoro) and the Luapula valley (Johnstone Falls) (means of December, January and February data)

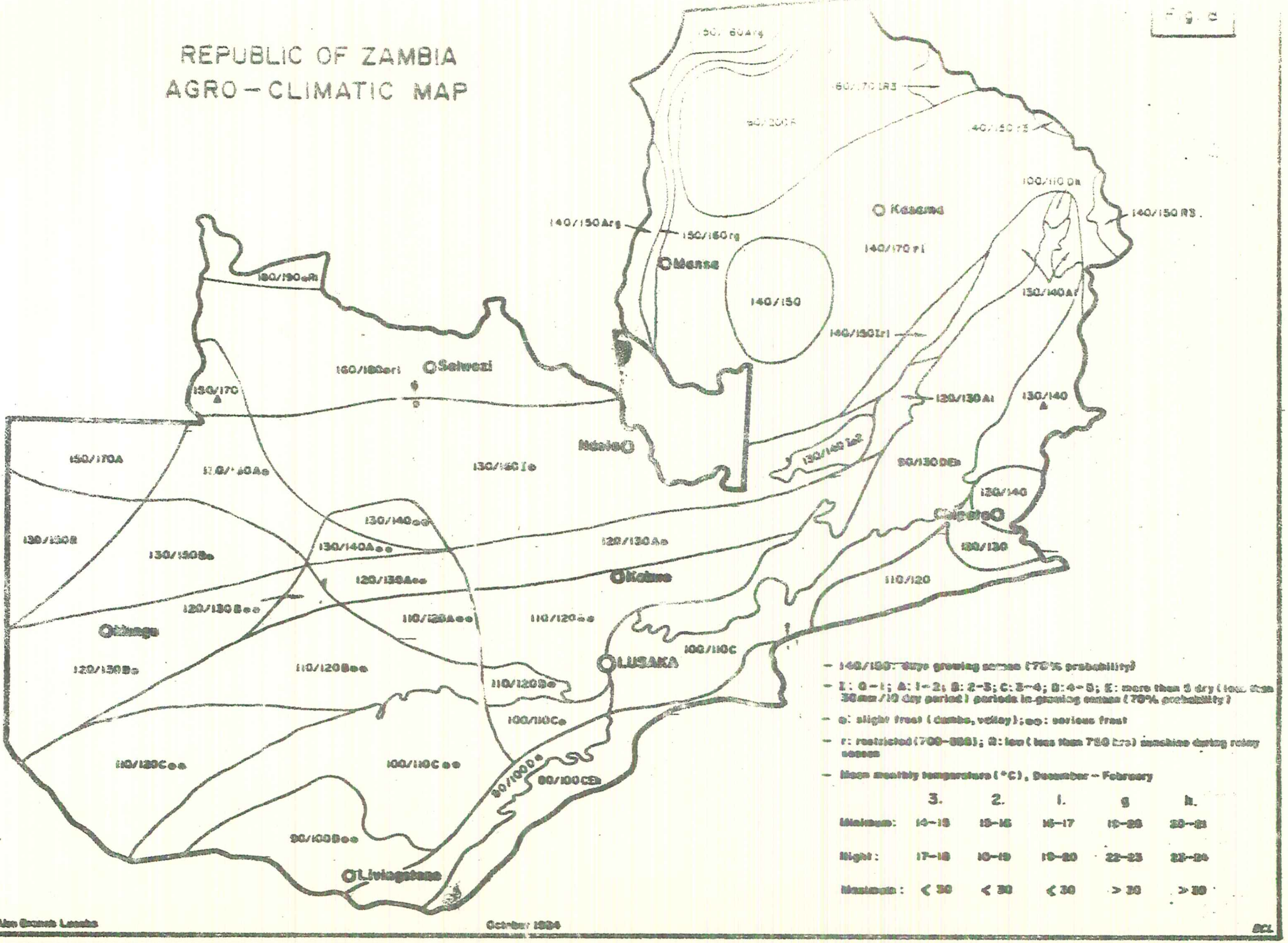
Station	Minimum	Night	Maximum (°C)
Solwezi	16.0	19.1	26.3
Mwinilunga	16.1	19.1	25.9
Kasempa	16.8	20.0	27.2
Kabompo	17.4	20.8	28.5
Lundazi	17.4	20.3	27.1
Chipata	18.0	20.8	27.4
Petauke	18.3	21.1	27.5
Choma	16.5	19.5	26.7
Serenje	15.8	18.8	25.7
Kabwe	17.3	20.2	26.6
Mt. Makulu	17.1	20.0	26.6
Kafue polder	18.1	21.2	28.4
Mongu	18.5	21.5	28.5
Kaoma	17.4	20.6	28.4
Sesheke	18.3	21.8	30.0
Livingstone	18.4	21.6	29.2
Kawambwa	16.5	19.5	26.2
Mansa	17.0	19.9	26.8
Ndola	17.0	19.8	26.4
Zambezi	17.6	20.8	28.2
Mbala	14.7	17.3	23.2
Mpika	16.1	19.0	25.5
Kasama	16.1	19.2	26.2
Samfya	17.4	20.4	27.0
Msoro	20.4	nd	30.3
Johnstone F.	19.6	nd	30.4

Fig. 7

REPUBLIC OF ZAMBIA
MEAN MONTHLY MINIMUM, NIGHT AND
MAXIMUM TEMPERATURE DURING
DECEMBER TO FEBRUARY (°C)



	MINIMUM	NIGHT	MAXIMUM
3	14 – 15	17 – 18	Less than 30
2	15 – 16	18 – 19	Less than 30
1	16 – 17	19 – 20	Less than 30
0–	17 – 18	20 – 21	Less than 30
0+	18 – 19	21 – 22	Less than 30
g	19 – 20	22 – 23	More than 30
h	20 – 21	23 – 24	More than 30



REPUBLIC OF ZAMBIA
AGRO-CLIMATIC MAP
Fig. 8
Kasama
Mansa
Solwezi
Ndola
Chipata
Kabwe
Mongu
LUSAKA
Livingstone
140/150
130/140
110/120
Mean monthly temperature (°C), December – February
3.
2.
1.
Maximum:
< 30
< 30
< 30
> 30
> 30

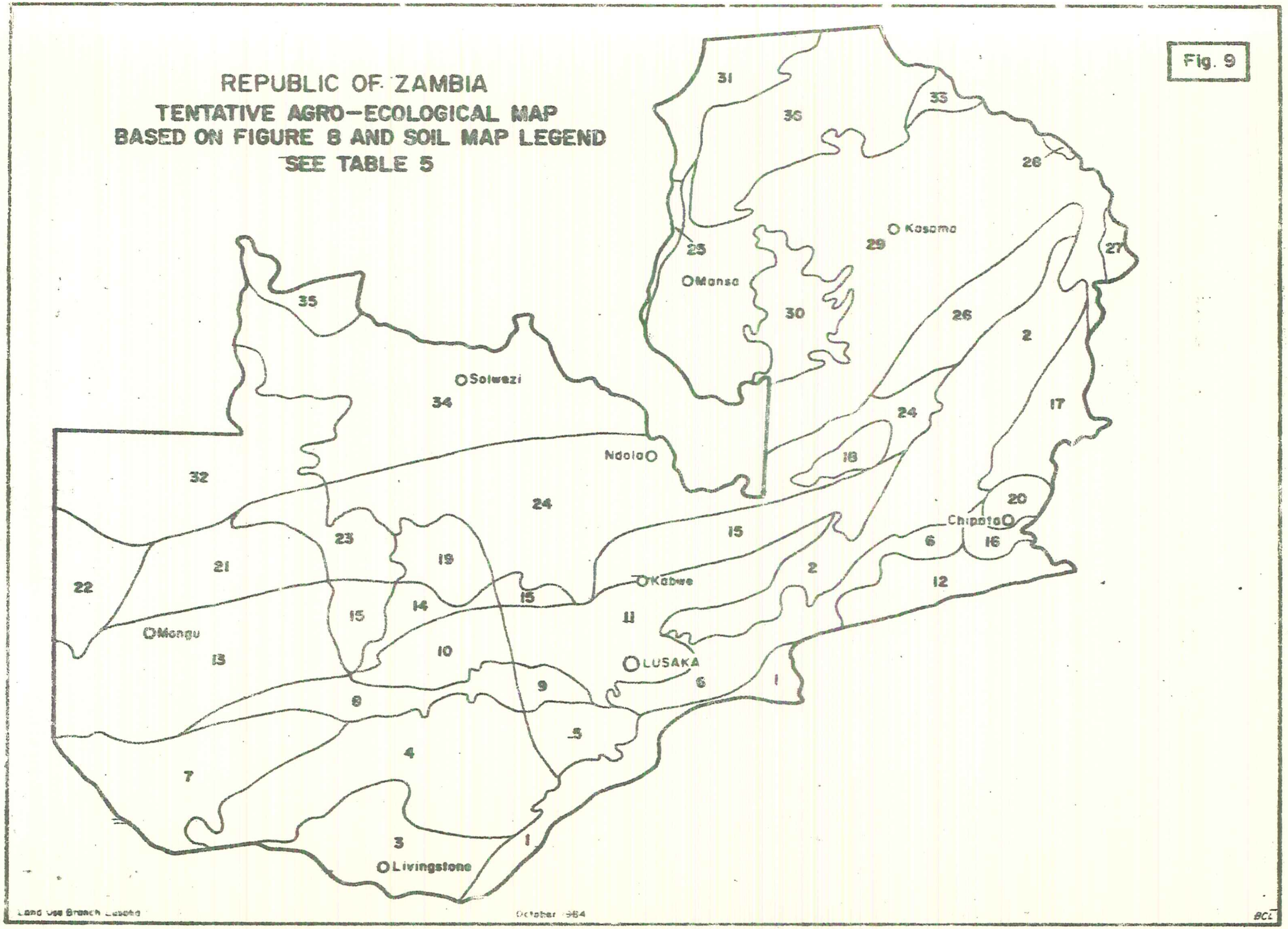


Fig. 9
REPUBLIC OF ZAMBIA
TENTATIVE AGRO-ECOLOGICAL MAP
BASED ON FIGURE 8 AND SOIL MAP LEGEND
SEE TABLE 5
Kasama
Mansa
Solwezi
Ndola
Chipata
Kabwe
Mongu
LUSAKA
Livingstone
Land Use Branch Lusaka
October 1964
BCL

Table 5. List of agro-ecological zones (cf.Fig. 9)

Zone no.	Length growing season 70% Prob.	mean value	Drought	Frost	Sunshine	Temp.	Name
1	80/100	135/147	CE	-	-	h	Gwembe/Feira
2	90/130	141/166	DE	-	-	h	Luangwa
3	90/100	141/147	D	**	-	-	Livingstone
4	100/110	147/152	C	**	-	-	Choma
5	100/110	147/152	C	*	-	-	Magoye
6	100/110	147/152	C	-	-	-	Refunso
7	110/120	152/159	C	**	-	-	Sioma
8	110/120	152/159	B	**	-	-	Namwala
9	110/120	152/159	B	*	-	-	Kafue
10	110/120	152/159	A	**	-	-	Musala
11	110/120	152/159	A	*	-	-	Lusaka
12	110/120	152/159	-	-	-	-	Petauke
13	120/130	159/166	B	*	-	-	Mongu
14	120/130	159/166	A	**	-	-	Chunga
15	120/130	159/166	A	*	-	-	Kahare/Mwwebe Kapiri
16	120/130	159/166	-	-	-	-	Chipata-South
17	130/140	156/173	A	-	-	-	Lundazi
18	130/140	166/173	I	*	-	2	Serenje
19	130/140	166/173	-	**	-	-	Busanga
20	130/140	166/173	-	-	-	-	Chipata-North
21	130/150	166/180	B	*	-	-	Lukulu
22	130/150	166/180	B	-	-	-	Kalabo
23	130/150	166/180	A	*	-	-	Mushima
24	130/160	166/180	I	*	-	-	Luanshya
25	140/150	173/180	A	-	r	9	Luapula-valley
26	140/150	173/180	I	-	r	1	Mpika
27	140/150	173/180	-	-	R	3	Nyika
28	140/150	173/180	-	-	r	3	Nakonde
29	140/170	173/195	-	-	r	1	Mansa/Kasama
30	140/150	103/180	-	-	-	-	Bangweulu
31	150/160	180/188	A	-	r	9	Mweru
32	150/170	180/195	A	*	-	-	Zambezi
33	160/170	180/195	I	-	R	3	Mambwe
34	160/180	188/204	-	*	r	1	Solwezi
35	180/190	204/212	-	*	R	1	Ikelengo
36	160/200	188/221	-	-	R	1	Mporokoso